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jc713 U.S. PTO

original patent application,

continuation-in-part application

03/17/00



INVENTOR(S): Chris Weyand et al

TITLE: Automatic Remote Firmware Upgrade

Enclosed are:

The Declaration and Power of Attorney.  signed     unsigned or partially signed  
 2 sheets of drawings (one set)     Associate Power of Attorney  
 Form PTO-1449     Information Disclosure Statement and Form PTO-1449  
 Priority document(s)     (Other)    (fee \$ \_\_\_\_\_)

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(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) TOTALS
TOTAL CLAIMS	20 — 20	0	X \$18	\$ 0
INDEPENDENT CLAIMS	3 — 3	0	X \$78	\$ 0
ANY MULTIPLE DEPENDENT CLAIMS	0		\$260	\$ 0
BASIC FEE: Design \$310.00    ); Utility \$690.00    )				\$ 690
TOTAL FILING FEE				\$ 690
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TOTAL CHARGES TO DEPOSIT ACCOUNT				\$ 690

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By Betty Hinkle

Typed Name: Betty Hinkle

Respectfully submitted,

Chris Weyand et al



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Signature: Betty Hinkle

**PATENT APPLICATION**  
**DOCKET NO. 10992045-1**

002740-4762560

**AUTOMATIC REMOTE FIRMWARE UPGRADE**

**INVENTORS:**

Chris Weyand  
Robert M. Ring

## AUTOMATIC REMOTE FIRMWARE UPGRADE

### FIELD OF THE INVENTION

The present invention relates to firmware associated with imaging systems. More specifically, the present invention relates to upgrading firmware from sources external to the imaging system.

### BACKGROUND OF THE INVENTION

5 Imaging systems such as printers, fax machines, and copiers are virtually omnipresent, and can be found in homes and offices worldwide. The development of such systems has facilitated improvements in communication that have in turn fostered an enormous change in the way people live and work. Telecommuting, paperless offices, and intra-office networks represent but a few  
10 examples of the advancements that have been made possible by modern imaging systems.

Some imaging systems, such as the HP LASERJET 8100 by Hewlett-Packard Company, use firmware as part of their operating systems. Firmware gets its name from having characteristics of both hardware and  
15 software, and is typically provided as permanent instructions embedded within ROM (read-only memory) chips, such as PROM - Programmable ROM and EPROM - Erasable Programmable ROM.

Over the "life" of an imaging system, it is advantageous to upgrade the system firmware to enhance the functionality of the imaging  
20 system. It is known to upgrade firmware using a feature referred to as Remote Firmware Upgrade (RFU), by which upgrades are acquired from sources external to the imaging system, such as web sites or dial-up databases. Known RFU features assume a "push" model requiring proactive participation of the imaging system user. The user can employ a PC to obtain an RFU downloadable image  
25 from the imaging system manufacturer's web site, then install the file in the imaging system firmware.

This approach presents a number of difficulties. For example, the push approach is not user-friendly. System users are unlikely to consider imaging system firmware upgrades to be a high priority, resulting in infrequent upgrades if they are remembered at all. The time involved in obtaining and

5 installing an upgrade is considerable, ranging from 15 to 30 minutes. New users are apt to make mistakes in downloading and installing the upgrade. Furthermore, obtaining and storing the RFU downloadable image can create computer problems. The size of the RFU downloadable image can be up to 8 MB which, if left undeleted by the user, takes up valuable disk space. Also, using a

10 PC to first obtain and then install the RFU downloadable image results in redundant network traffic.

The complexity, inconvenience, and potential for error involved in known RFU features present a significant obstacle to making otherwise desirable changes. Consequently, this undeniably useful feature is not being used to its

15 fullest potential in existing system configurations.

It can thus be seen that the need exists for RFU features that ameliorate the disadvantages of those used in known systems.

#### SUMMARY OF THE INVENTION

These and other objects are achieved by providing an imaging

20 system including firmware. The imaging system includes a communications device adapted and constructed to facilitate communication between the imaging device and a remote source of information. An automatic remote firmware update mechanism is adapted to selectively and automatically retrieve firmware upgrade information from the remote source of information via the

25 communications device. The automatic remote firmware update mechanism can also selectively and automatically install the firmware upgrade information into the firmware of the imaging system.

The automatic remote firmware update mechanism can form a part of firmware installed in the imaging system. The communications device can be

30 provided as a modem adapted to connect to, and access information from, a

web site, or as a network interface card, such as an HP JetDirect card, which will connect a printer to a LAN.

The imaging system can also include a flag mechanism for storing a value corresponding to an update trigger parameter. A flag parameter update

5 mechanism can be provided to incrementally increase the update trigger parameter in response to a sensed condition. A trigger mechanism is adapted to actuate the automatic remote firmware update mechanism to automatically retrieve firmware upgrade information when the update trigger parameter reaches a predetermined update value. The sensed condition can be a condition  
10 such as page count through the imaging system, or the passage of a predetermined amount of time. The imaging system is also adapted to periodically check the update trigger parameter, and to compare downloaded firmware upgrade information to existing firmware to determine the necessity of installing the downloaded firmware upgrade information.

15 The imaging system can include a mechanism for notifying a system user when firmware has been upgraded.

A method of updating firmware is also provided in conjunction with an imaging system including firmware, and a communications device adapted and constructed to facilitate communication between the imaging device and a

20 remote source of information. In a first step, firmware upgrade information is selectively and automatically retrieved from the remote source of information via the communications device. Next, the firmware upgrade information is selectively installed into the firmware of the imaging system.

The features of the invention believed to be patentable are set  
25 forth with particularity in the appended claims. The invention itself, however, both as to organization and method of operation, together with further objects and advantages thereof, may be best understood by reference to the following description taken in conjunction with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic illustration of an imaging system in accordance with the principles of the present invention.

FIG. 2 is a flow chart illustrating the operation of an imaging system including a remote firmware update feature in accordance with the principles of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

An imaging system 10 in accordance with the principles of the present invention is shown in FIG. 1. The imaging system 10 can be provided, 10 for example, as a printer, copier, or fax machine. The illustrative examples that follow are set in the context of a LASERJET printer manufactured by Hewlett-Packard Company. It will be understood, however, that the principles of the present invention are applicable to any suitable imaging system.

The imaging system 10 includes a control panel 12 which provides 15 a user interface mechanism. The control panel 12 can be, for example, a keyboard or touchscreen as is known in the art. The control panel 12 is connected to imaging system firmware 14, which contains permanent instructions embedded within a ROM chip. The system 10 also includes a communications device 16, which may be provided as a modem or other 20 communications interface. One example of such a device is a JET DIRECT card available from Hewlett-Packard Company.

In accordance with the present invention, the imaging system 25 firmware 14 includes a Remote Firmware Upgrade (RFU) feature 18. The RFU feature 18 is composed of a set of programming instructions, residing in the firmware 14, that allow the RFU feature 18, in conjunction with the operating system of the imaging system 10 and a remote source of information or external data source 20 (external to the imaging system firmware), to automatically obtain firmware upgrades at pre-set intervals.

Those of skill in the art will recognize that the specific programming used to achieve the results described herein will become apparent upon appreciation of the operational flow chart set forth in FIG. 2. The remote firmware upgrade process begins at point 22, wherein the imaging system is 5 configured. The imaging system firmware can configure an update value which, when met, acts as a point at which the system should update itself in response to a sensed condition, such as page count or the passage of time. The configuration can be a factory pre-set. Alternatively, the system user can 10 configure the system using the control panel, a PML object, or a PJL variable. It is contemplated that, although the need for updates will vary in different 15 situations, reasonable restrictions should be placed on the update value so that the web site or other information source is not overwhelmed, yet users still get reasonably frequent upgrades.

After the imaging system is actuated at point 24, the firmware 15 checks the update trigger parameter at point 26. As the system operates, a flag parameter update mechanism incrementally increases the update trigger parameter in response to a sensed condition, as described above. At point 28, a flag mechanism is invoked. The flag mechanism compares the update trigger parameter to the update value from the system configuration. If the update 20 trigger parameter does not meet the update value, system status returns to point 24. If the update trigger parameter meets the update value, a trigger mechanism is adapted to actuate the automatic remote firmware update mechanism to automatically connect to the outside source of information at point 30. At point 32, the automatic remote firmware update mechanism 25 retrieves firmware upgrade information. If the information source is a web site, retrieval includes establishing a connection with the web site, then downloading the image file.

The downloaded information is compared to existing firmware at point 34, in order to determine whether or not the upgrade is needed. If the 30 existing firmware is the latest version, the update flag is re-set at point 38, and system status returns to point 24.

If the existing firmware needs to be upgraded, the system reconnects to the information source at point 40, then downloads the firmware at point 42. The upgrade can then be installed at point 44.

It may be desirable to notify the user or system administrator at 5 point 46 that the upgrade has been completed. Alternatively, a notice requesting user permission to install the upgrade could be generated between points 36 and 40.

The advantages over known systems are many and varied. For 10 example, once the system is configured to autoupgrade, users receive the most up-to-date firmware, thus reducing technical support calls and increasing user satisfaction. The possibility of user download error, and the need for user computer space and user time is eliminated. Network traffic is halved, since the firmware upgrade is downloaded directly to the imaging system.

Although the present invention has been described with reference 15 to specific embodiments, those of skill in the art will recognize that changes may be made thereto without departing from the scope and spirit of the invention as defined by the appended claims.

CLAIMS

What is claimed is:

1           1. An imaging system comprising the following:  
2           firmware associated with the imaging system;  
3           a communications device adapted and constructed to facilitate  
4 communication between the imaging system and a remote source of  
5 information; and  
6           an automatic remote firmware update mechanism adapted to  
7 selectively and automatically retrieve firmware upgrade information from the  
8 remote source of information via the communications device, and to selectively  
9 and automatically install the firmware upgrade information into the firmware of  
10 the imaging system.

1           2. An imaging system according to claim 1, wherein the  
2 automatic remote firmware update mechanism comprises a part of firmware  
3 installed in the imaging system.

1           3. An imaging system according to claim 1, wherein the  
2 communications device is selected from a group consisting of a modem and a  
3 network interface card.

1           4. An imaging system according to claim 3, wherein the  
2 communication device further comprises means for connecting to, and accessing  
3 information from, a web site.

1           5. An imaging system according to claim 1, further comprising  
2 the following:  
3           flag means for storing a value corresponding to an update trigger  
4 parameter;

5 flag parameter update means for incrementally increasing the  
6 update trigger parameter in response to a sensed condition; and  
7 trigger means for actuating the automatic remote firmware update  
8 mechanism to automatically retrieve firmware upgrade information when the  
9 update trigger parameter reaches a predetermined update value.

6. An imaging system according to claim 5, wherein the flag parameter update means incrementally increases the update trigger parameter value in response to page count through the imaging system.

1                   7. An imaging system according to claim 5, wherein the flag  
2 parameter update means incrementally increases the update trigger parameter  
3 value in response to the passage of a predetermined amount of time.

1                   8. An imaging system according to claim 5, further comprising  
2 means for periodically checking the update trigger parameter.

1                   9. An imaging system according to claim 1, further comprising  
2 means for comparing downloaded firmware upgrade information to existing  
3 firmware to determine the necessity of installing the downloaded firmware  
4 upgrade information.

1 10. An imaging system according to claim 1, further comprising  
2 means for notifying a system user when firmware is to be upgraded.

1                   11. In an imaging system including firmware and a  
2   communications device adapted and constructed to facilitate communication  
3   between the imaging device and a remote source of information, a method of  
4   updating firmware comprising the following steps:

5 selectively and automatically retrieving firmware upgrade  
6 information from the remote source of information via the communications  
7 device; and

8                   selectively installing the firmware upgrade information into the  
9                   firmware of the imaging system.

1                   12. A method according to claim 11, wherein the step of  
2 retrieving firmware upgrade information comprises retrieving firmware upgrade  
3 information from a web site.

3 storing a value corresponding to an update trigger parameter;  
4 sensing a condition;  
5 incrementally increasing the update trigger parameter in response  
6 to the sensed condition; and  
7 actuating the automatic remote firmware update mechanism to  
8 automatically retrieve firmware upgrade information when the update trigger  
9 parameter reaches a predetermined update value.

1 14. A method according to claim 13, wherein the step of  
2 sensing a condition comprises sensing page count through the imaging system,  
3 and the step of incrementally increasing the update trigger parameter comprises  
4 incrementally increasing the update trigger parameter value in response to page  
5 count through the imaging system.

15. A method according to claim 13, wherein the step of  
sensing a condition comprises sensing the passage of time, and the step of  
incrementally increasing the update trigger parameter comprises incrementally  
increasing the update trigger parameter value in response to the passage of a  
predetermined amount of time.

1                   16. A method according to claim 13, further comprising the  
2 step of periodically checking the update trigger parameter.

1                   17. A method according to claim 11, further comprising the step  
2 of comparing downloaded firmware upgrade information to existing firmware to  
3 determine the necessity of installing the downloaded firmware upgrade  
4 information.

1                   18. A method according to claim 11, further comprising the step  
2 of notifying a system user when firmware has been upgraded.

1                   19. A printer comprising the following:  
2                   firmware installed in the printer;  
3                   a telecommunications device adapted and constructed to facilitate  
4 communication between the printer and a web site containing firmware upgrade  
5 information; and  
6                   an automatic remote firmware update mechanism adapted to  
7 selectively and automatically retrieve firmware upgrade information from the  
8 web site via the telecommunications device, and to selectively and automatically  
9 install the firmware upgrade information into the firmware of the printer.

1                   20. A printer according to claim 19, wherein the automatic  
2 remote firmware update mechanism adapted to selectively and automatically  
3 download firmware update image files from the web site.

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ABSTRACT

An imaging system including firmware is disclosed. The imaging system includes a communications device adapted and constructed to facilitate communication between the imaging device and a remote source of information. An automatic remote firmware update mechanism is adapted to selectively and 5 automatically retrieve firmware upgrade information from the remote source of information via the communications device. The automatic remote firmware update mechanism can also selectively and automatically install the firmware upgrade information into the firmware of the imaging system. The automatic remote firmware update mechanism can form a part of firmware 10 installed in the imaging system. The communications device can be provided as a modem, or as a network interface card. The imaging system can also include a flag mechanism for storing a value corresponding to an update trigger parameter. A flag parameter update mechanism can be provided to incrementally increase the update trigger parameter in response to a sensed condition. A 15 trigger mechanism is adapted to actuate the automatic remote firmware update mechanism to automatically retrieve firmware upgrade information when the update trigger parameter reaches a predetermined update value. The sensed condition can be a condition such as page count through the imaging system, or the passage of a predetermined amount of time. The imaging system is also 20 adapted to periodically check the update trigger parameter, and to compare downloaded firmware upgrade information to existing firmware to determine the necessity of installing the downloaded firmware upgrade information. A method of updating firmware is also provided.

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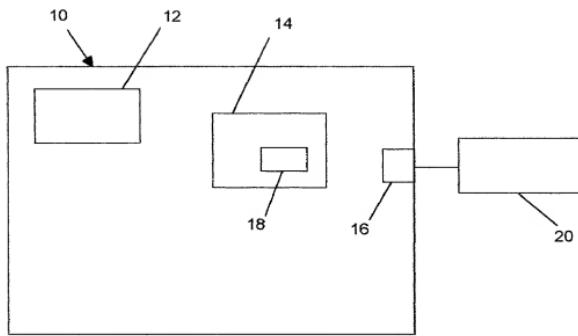


FIG. 1

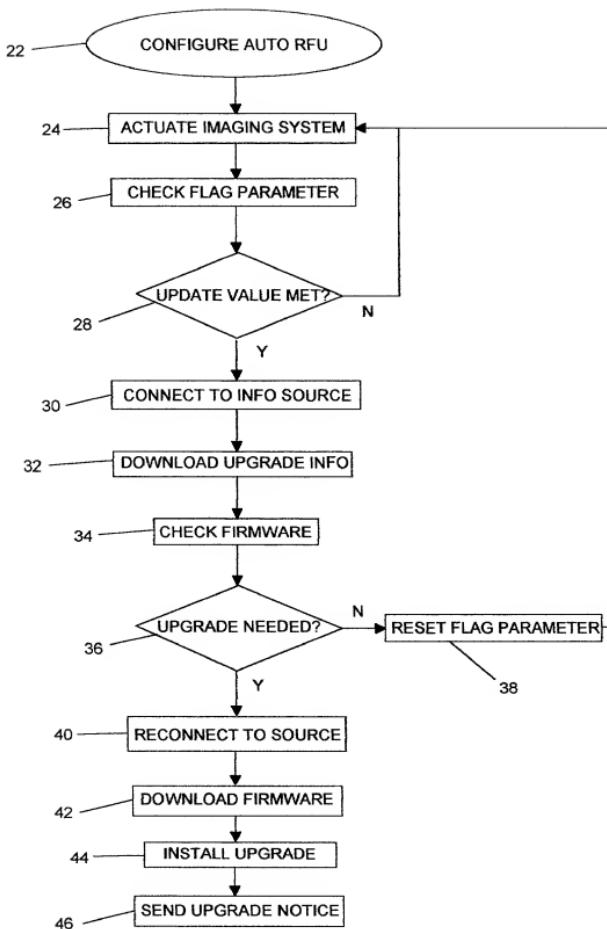


FIG. 2

DECLARATION AND POWER OF ATTORNEY  
FOR PATENT APPLICATION

ATTORNEY DOCKET NO. 10992045-1

As a below named inventor, I hereby declare that:

My residence/post office address and citizenship are as stated below next to my name:

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

**Automatic Remote Firmware Upgrade**

the specification of which is attached hereto unless the following box is checked:

() was filed on \_\_\_\_\_ as US Application Serial No. or PCT International Application Number \_\_\_\_\_ and was amended on \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understood the contents of the above-identified specification, including the claims, as amended by any amendment(s) referred to above. I acknowledge the duty to disclose all information which is material to patentability as defined in 37 CFR 1.56.

**Foreign Application(s) and/or Claim of Foreign Priority**

I hereby claim foreign priority benefits under Title 35, United States Code Section 119 of any foreign application(s) for patent or inventor(s) certificate listed below and have also identified below any foreign application for patent or inventor(s) certificate having a filing date before that of the application on which priority is claimed:

COUNTRY	APPLICATION NUMBER	DATE FILED	PRIORITY CLAIMED UNDER 35 U.S.C. 119
			YES: <input type="checkbox"/> NO: <input type="checkbox"/>
			YES: <input type="checkbox"/> NO: <input type="checkbox"/>

**Provisional Application**

I hereby claim the benefit under Title 35, United States Code Section 119(e) of any United States provisional application(s) listed below:

APPLICATION SERIAL NUMBER	FILING DATE

**U. S. Priority Claim**

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT International filing date of this application:

APPLICATION SERIAL NUMBER	FILING DATE	STATUS (patented/pending/abandoned)

**POWER OF ATTORNEY:**

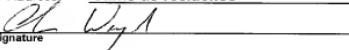
As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

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Number Bar Code  
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Intellectual Property Administration  
P.O. Box 272400  
Fort Collins, Colorado 80528-9599

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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**DECLARATION AND POWER OF ATTORNEY  
FOR PATENT APPLICATION (continued)**

ATTORNEY DOCKET NO. 10992045-1

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Inventor's Signature  Date 13 March 2000

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Residence: \_\_\_\_\_

Post Office Address: \_\_\_\_\_

Inventor's Signature \_\_\_\_\_ Date \_\_\_\_\_

Full Name of # 4 joint inventor: \_\_\_\_\_ Citizenship: \_\_\_\_\_

Residence: \_\_\_\_\_

Post Office Address: \_\_\_\_\_

Inventor's Signature \_\_\_\_\_ Date \_\_\_\_\_

Full Name of # 5 joint inventor: \_\_\_\_\_ Citizenship: \_\_\_\_\_

Residence: \_\_\_\_\_

Post Office Address: \_\_\_\_\_

Inventor's Signature \_\_\_\_\_ Date \_\_\_\_\_

Full Name of # 6 joint inventor: \_\_\_\_\_ Citizenship: \_\_\_\_\_

Residence: \_\_\_\_\_

Post Office Address: \_\_\_\_\_

Inventor's Signature \_\_\_\_\_ Date \_\_\_\_\_

Full Name of # 7 joint inventor: \_\_\_\_\_ Citizenship: \_\_\_\_\_

Residence: \_\_\_\_\_

Post Office Address: \_\_\_\_\_

Inventor's Signature \_\_\_\_\_ Date \_\_\_\_\_

Full Name of # 8 joint inventor: \_\_\_\_\_ Citizenship: \_\_\_\_\_

Residence: \_\_\_\_\_

Post Office Address: \_\_\_\_\_

Inventor's Signature \_\_\_\_\_ Date \_\_\_\_\_